CLAIMS

What is claimed:

1. A process for the conversion of hydrocarbons, comprising:

feeding a mixture of first particles and second particles from a regenerator to a transport vessel or riser reactor, wherein the first particles have a smaller average particle size and/or are less dense than the second particles, and wherein the first particles and second particles may independently be catalytic or non-catalytic particles;

feeding a reactive and/or non-reactive carrier fluid to the transport vessel or riser reactor;

recovering an overhead product from the transport vessel / riser reactor comprising the carrier fluid and/or a reaction product of the carrier fluid, the second particles, and the first particles;

feeding the overhead product to an integrated disengagement vessel, the integrated disengagement vessel comprising:

a housing;

a solids separation device disposed within the housing for separating the second particles from the overhead product to provide a first stream, comprising the first particles and the carrier fluid and/or a reaction product of the carrier fluid, and a second stream, comprising the separated second particles;

one or more cyclones disposed within the housing for separating the first stream to recover a solids fraction, comprising the first particles, and a vapor fraction, comprising the carrier fluid and/or a reaction product of the carrier fluid;

an internal vessel disposed within the housing for receiving the second stream comprising the separated second particles;

an annular region between the housing and the internal vessel for receiving the solids fraction comprising the first particles;

a vapor outlet for recovering the vapor fraction;

a first solids outlet fluidly connected to the annular region; and

a second solids outlet fluidly connected to the internal vessel;

recovering the solids fraction from the annular region via the first solids outlet; and

recovering the separated second particles via the second solids outlet.

2. The process of claim 1, further comprising feeding the solids fraction comprising the separated first particles from the annular region to the regenerator.
3. The process of claim 2, further comprising feeding the separated second particles from the internal vessel to the transport vessel or riser reactor, wherein the separated second particles are mixed with the mixture of first particles and second particles from the regenerator.
4. The process of claim 1, further comprising feeding the separated second particles from the internal vessel to the regenerator.
5. The process of claim 4, further comprising feeding the solids fraction comprising the separated first particles from the annular region to the transport vessel or riser reactor, wherein the separated second particles are mixed with the mixture of first particles and second particles from the regenerator.
6. The process of claim 1, further comprising:
   feeding the separated second particles from the internal vessel to a reactor;
   contacting the separated second particles with a hydrocarbon feedstock to crack the hydrocarbon feedstock.
7. A process for the conversion of hydrocarbons, comprising:
   feeding a mixture of first particles and second particles from a regenerator to a riser reactor, wherein the first particles have a smaller average particle size and/or are less dense than the second particles, and wherein the first particles and second particles may independently be catalytic or non-catalytic particles;
   feeding a hydrocarbon fraction to the riser reactor and contacting the hydrocarbon fraction with the mixture of first particles and second particles to convert at least a portion of the hydrocarbon fraction;
   recovering an overhead product from the riser reactor comprising the converted hydrocarbon fraction, the second particles, and the first particles;
   feeding the overhead product to an integrated disengagement vessel, the integrated disengagement vessel comprising:
      a housing;
      a solids separation device disposed within the housing for separating the second particles from the overhead product to provide a first stream, comprising the first particles and the converted hydrocarbon fraction, and a second stream, comprising the separated second particles;

one or more cyclones disposed within the housing for separating the first stream to recover a solids fraction, comprising the first particles, and a vapor fraction, comprising the converted hydrocarbon fraction;

an internal vessel disposed within the housing for receiving the second stream comprising the separated second particles;

an annular region between the housing and the internal vessel for receiving the solids fraction comprising the first particles;

a vapor outlet for recovering the vapor fraction;

feeding the solids fraction from the annular region to the regenerator; and

enhancing a concentration of the second particles within the riser reactor by feeding the separated second particles from the internal vessel to the riser reactor, wherein the separated second particles are mixed with the mixture of first particles and second particles from the regenerator.

8. The process of claim 7, further comprising:

feeding a second hydrocarbon feedstock and a mixture of first particles and second particles to a second reactor;

contacting the mixture of first and second particles with a second hydrocarbon feedstock to crack the second hydrocarbon feedstock and form a second reactor effluent comprising lighter hydrocarbons and a mixture of first and second particles;

feeding the second reactor effluent to a separator to separate the first and second particles from the lighter hydrocarbons and the converted hydrocarbon effluent; and

recovering a hydrocarbon product from the separator.

9. The process of claim 8, further comprising:

feeding fresh second particles to the riser reactor; and

feeding fresh first particles to the regenerator.

10. The process of claim 8, further comprising:

feeding the vapor fraction recovered via the vapor outlet and feeding the hydrocarbon product recovered from the separator to a fractionation system for separating the hydrocarbon products therein into two or more hydrocarbon fractions including a naphtha fraction; and

feeding the naphtha fraction to the riser reactor as the hydrocarbon feedstock.

11. The process of claim 7, further comprising adjusting a vapor split ratio in the solids separation device to carry over a portion of the second catalyst in the first stream.

12. A system for cracking hydrocarbons, comprising:

a regenerator;

a riser reactor configured to:

receive a mixture of first particles and second particles from the regenerator, wherein the first particles have a smaller average particle size and/or are less dense than the second particles, and wherein the first particles and second particles may independently be catalytic or non-catalytic particles;

contact a hydrocarbon fraction with the mixture of first particles and second particles to convert at least a portion of the hydrocarbon fraction; and

produce an overhead product from the riser reactor comprising the converted hydrocarbon fraction, the second particles, and the first particles;

an integrated disengagement vessel configured to receive the overhead product, the integrated disengagement vessel comprising:

a housing;

a solids separation device disposed within the housing for separating the second particles from the overhead product to provide a first stream, comprising the first particles and the converted hydrocarbon fraction, and a second stream, comprising the separated second particles;

one or more cyclones disposed within the housing for separating the first stream to recover a solids fraction, comprising the first particles, and a vapor fraction, comprising the converted hydrocarbon fraction;

an internal vessel disposed within the housing for receiving the second stream comprising the separated second particles;

an annular region between the housing and the internal vessel for receiving the solids fraction comprising the first particles;

a vapor outlet for recovering the vapor fraction;

a flow line for feeding the solids fraction from the annular region to the regenerator; and

a flow line for enhancing a concentration of the second particles within the riser reactor by feeding the separated second particles from the internal vessel to the riser reactor, wherein the separated second particles are mixed with the mixture of first particles and second particles from the regenerator.

13. The system of claim 12, further comprising:

a second reactor configure to receive a second hydrocarbon feedstock and a mixture of first particles and second particles from the regenerator, wherein the mixture of first and second particles is contacted with a second hydrocarbon feedstock to crack the second hydrocarbon feedstock and form a second reactor effluent comprising lighter hydrocarbons and a mixture of first and second particles;

a separator configured to receive the second reactor effluent and to separate the first and second particles from the lighter hydrocarbons and the converted hydrocarbon effluent.

14. The system of claim 12, further comprising:

a flow line for feeding fresh second particles to the riser reactor; and

a flow line for feeding fresh first particles to the regenerator.

15. The system of claim 12, further comprising:

a fractionation system configured for receiving both the vapor fraction recovered via the vapor outlet and the hydrocarbon product recovered from the separator and for separating the hydrocarbon products therein into two or more hydrocarbon fractions including a naphtha fraction; and

a flow line for feeding the naphtha fraction to the riser reactor as the hydrocarbon feedstock.

16. The system of claim 12, further comprising a controller configured to adjust a vapor split ratio in the solids separation device to carry over a portion of the second catalyst in the first stream.